Ordering number : EN4863

CMOS LSI

No. 4863

SANYO

LC7536R

High Breakdown Voltage Serial Control Electronic Volume Control

Overview

The LC7536R is an electronic volume control IC that implements volume and balance functions with a minimum number of external components.

Features

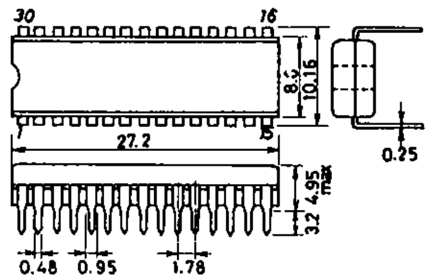
- The LC7536R is controlled by a 3-wire (DI, CL and CE) serial data control scheme that can be shared with other ICs. Up to two LC7536Rs can be used on the same bus by using the S (select) pin.
- Eighty positions in 1 dB steps plus mute (–∞), maximum attenuation is over 80 dB
- Input impedance (5 dB inputs): 47 kΩ (typical)
- High breakdown voltage: ±16 V

Package Dimensions

unit: mm

3047A-DIP30S

[LC7536R]



SANYO: DIP30S

Specifications

Absolute Maximum Ratings at Ta = 25°C, V_{SS} = 0 V

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{DD} max	$V_{EE} \le V_{SS} < V_{CC} < V_{DD}$	V_{SS} to V_{SS} + 18	V
	V_{EE} max	$V_{EE} \le V_{SS} < V_{CC} < V_{DD}$	V_{SS} – 18 to V_{SS}	V
	V_{CC} max	$V_{EE} \le V_{SS} < V_{CC} < V_{DD}$	V_{SS} to V_{SS} + 7	V
Input voltage	V_I1	CL, DI, CE	0 to V_{DD} + 0.3	V
	V_I2	IN1, IN2	V_{EE} – 0.3 to V_{DD} + 0.3	V
	V_I3	S	V_{CC} – 0.3 to V_{DD} + 0.3	V
Allowable power dissipation	Pd max	Ta ≤ 75°C	250	mW
Operating temperature	Topr		–30 to +75	°C
Storage temperature	Tstg		–40 to +125	°C

SANYO Electric Co., Ltd. Semiconductor Business Headquarters
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110 JAPAN

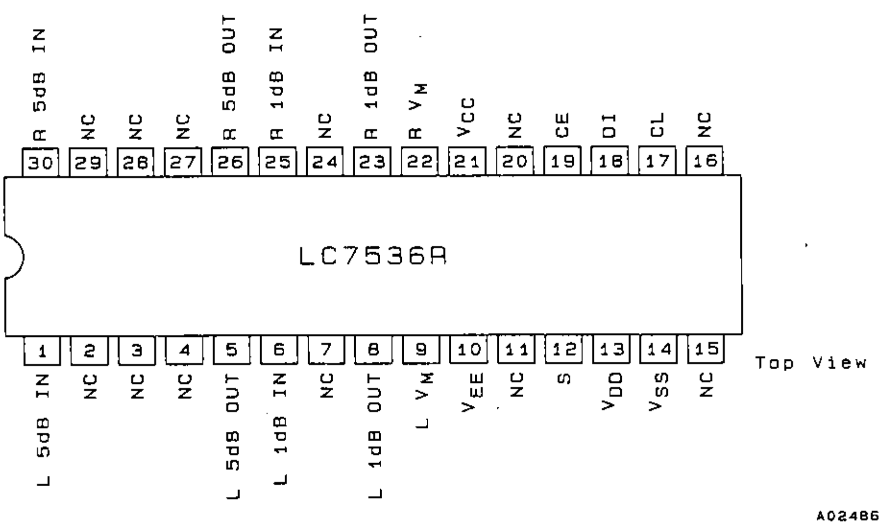
Allowable Operating Ranges at Ta = 25°C, V_{SS} = 0 V

Parameter	Symbol	Conditions	min	typ	max	Unit
Supply voltage	V_{DD}		V_{CC} + 4.5		16	V
	V_{EE}		–16		0	V
	V_{CC}		4.5	5	5.5	V
Input high level voltage	$V_{IH}1$	CL, DI, CE	0.8 V_{CC}		V_{CC}	V
Input low level voltage	$V_{IL}1$	CL, DI, CE	V_{SS}		0.2 V_{CC}	V
Input high level voltage	$V_{IH}2$	S	0.8 × (V_{DD} – V_{CC}) + V_{CC}		V_{DD}	V
Input low level voltage	$V_{IL}2$	S	V_{CC}		0.2 × (V_{DD} – V_{CC}) + V_{CC}	V
Input pulse width	$t_{øW}$	CL	1			µs
Setup time	$t_{set\ up}$	CL, DI, CE	1			µs
Hold time	t_{hold}	CL, DI, CE	1			µs
Operating frequency	f_{opg}	CL			500	kHz
Input signal amplitude	V_{IN}	IN1, IN2	V_{EE}		V_{DD}	V
Input leakage current	I_{IN}	CL, DI, CE, S	–10		+10	µA

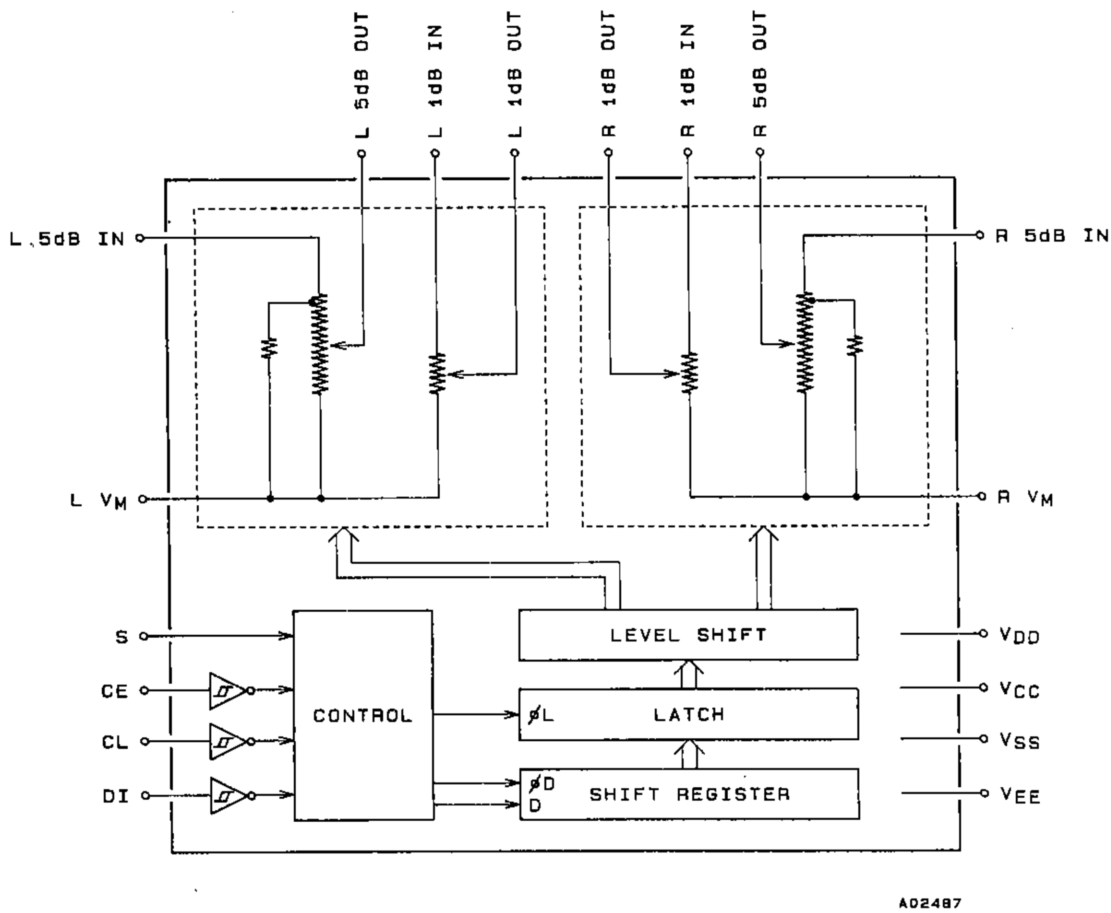
Electrical Characteristics at Ta = 25°C, V_{SS} = 0 V

Parameter	Symbol	Conditions	min	typ	max	Unit
Current drain	I_{DD}				1	mA
	I_{CC}				1	mA
Output off leakage current	I_{OFF}	IN1, IN2, V_M1, V_M2, CT1, CT2, OUT1, OUT2, analog switch off	–10		+10	µA
Total harmonic distortion	THD1	V_{IN} = 1 Vrms, f = 1 kHz, V_{DD} – V_{EE} = 32 V, V_R = max		0.004		%
	THD2	V_{IN} = 0.1 Vrms, f = 1 kHz, V_{DD} – V_{EE} = 32 V, V_R = max		0.02		%
Inter-channel crosstalk	C_T	OUT1 and OUT2, with a 20 kHz 1 Vrms input to one channel		–75	–60	dB
Output at maximum attenuation	V_O	f = 20 kHz, V_{IN} = 1 Vrms		–98		dB

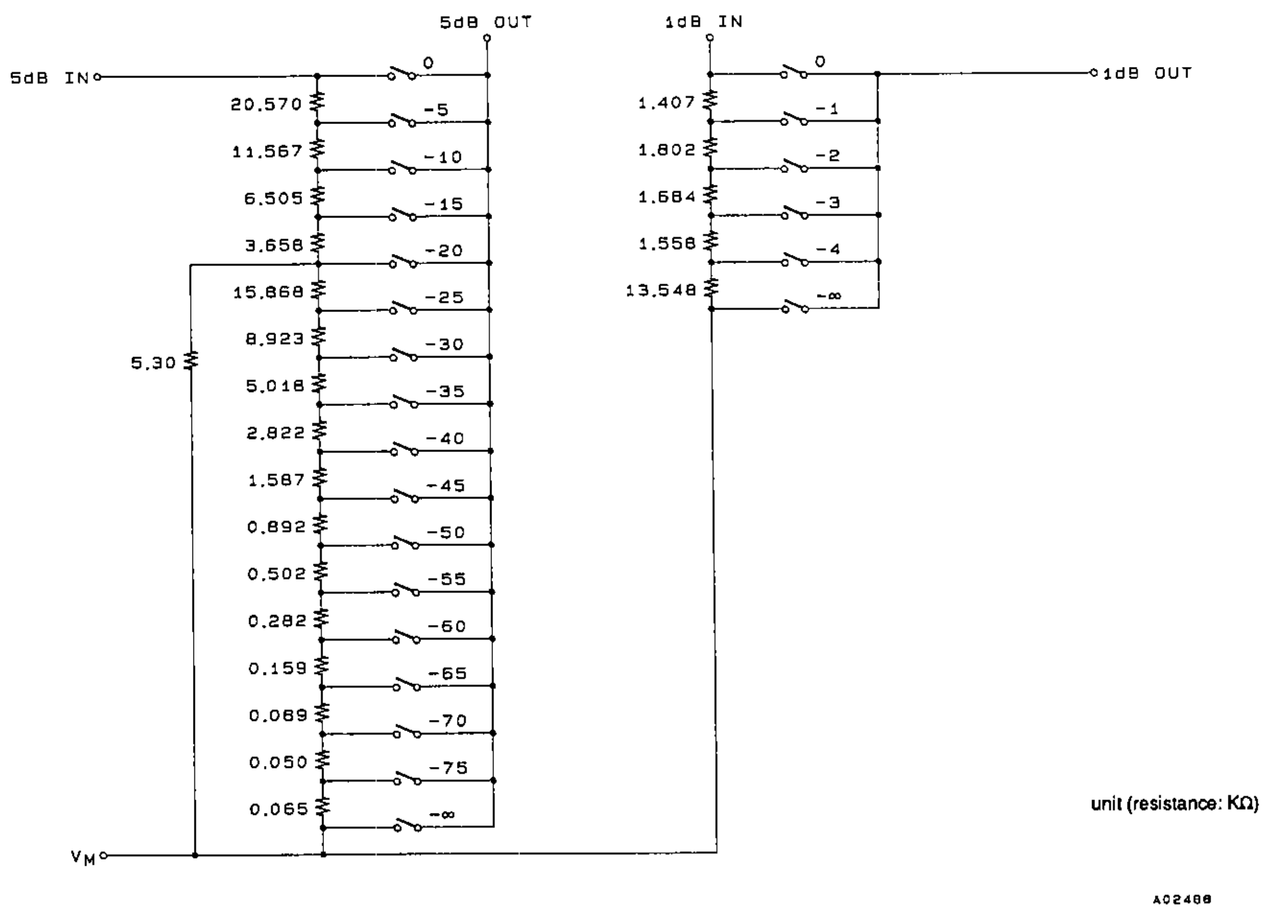
Pin Assignment



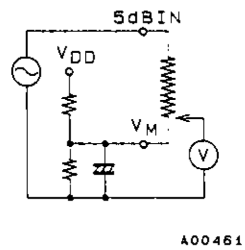
Equivalent Circuit Block Diagram



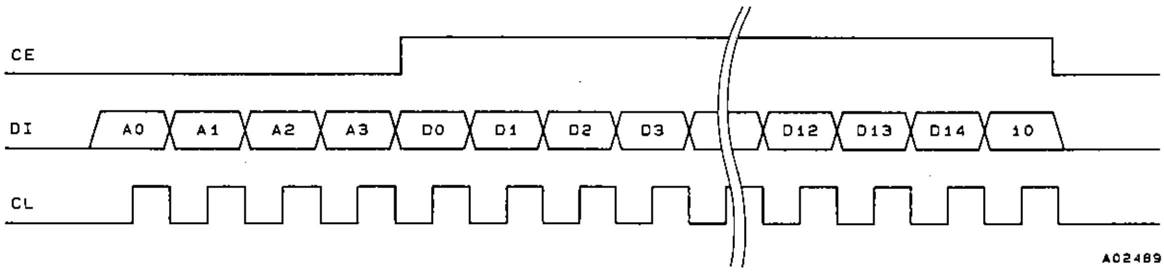
Internal Resistor Equivalent Circuit Diagram



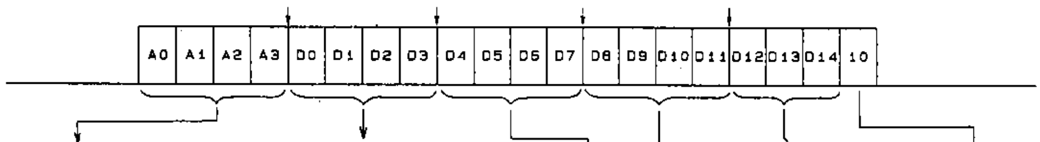
Pin Functions

Pin No.	Symbol	Function	Note
1	L 5dBIN	Inputs to the 5 dB step attenuator. Must be driven by low impedance outputs.	
30	R 5dBIN		
3	NC	No connection	
4	NC		
28	NC		
27	NC		
5	L 5dBOUT	Outputs from the 5 dB step attenuator. Outputs should be received by a load of about 1 MΩ.	
26	R 5dBOUT		
6	L 1dBIN	Inputs to the 1 dB step attenuator. Must be driven by low impedance outputs.	
25	R 1dBIN		
8	L 1dBOUT	Outputs from the 1 dB step attenuator. Outputs should be received by a load in the range 47 kΩ to 1 MΩ.	
23	R 1dBOUT		
9	L V_M	Volume control common connections. The impedance of the pattern connected to these pins should be lowered as far as possible. Since LV_M, RV_M and V_{SS} are not connected internally, they should be connected externally according to their respective specifications. In particular, when a single-sided power supply is used, the capacitor connected between V_M and V_{SS} appears as the residual resistance when the volume is attenuated. Thus care is required when selecting the value for this capacitor.	
22	R V_M		
12	S	Selection pin for the address code in the data format. When this pin is connected to V_{DD}, the LC7536R will accept data when the address code is 9 and when connected to V_{CC}, the LC7536R will accept data when the address code is 8.	
17	CL	Inputs for controlling the LC7536R from serial data. Signals should have an amplitude of 0 to 5 V.	
18	DI		
19	CE		
10	V_{EE}	Power supply connections. Do not bring up the V_{CC} voltage before the V_{DD} voltage when powering up the LC7536R.	
13	V_{DD}		
14	V_{SS}		
21	V_{CC}		
2, 7, 11, 15, 16, 20, 24, 29	NC	No connection	

Data Format



Data consists of a total of 20 bits.



Do not care

Address code

S pin	A0	A1	A2	A3
V_{DD}	1	0	0	1
V_{CC}	0	0	0	1

Right channel 5 dB step

	D0	D1	D2	D3
−75dB	0	0	0	0
−70dB	1	0	0	0
−65dB	0	1	0	0
−60dB	1	1	0	0
−55dB	0	0	1	0
−50dB	1	0	1	0
−45dB	0	1	1	0
−40dB	1	1	1	0
−35dB	0	0	0	1
−30dB	1	0	0	1
−25dB	0	1	0	1
−20dB	1	1	0	1
−15dB	0	0	1	1
−10dB	1	0	1	1
−5dB	0	1	1	1
0dB	1	1	1	1

Left channel 5 dB step
(Identical to the left channel)

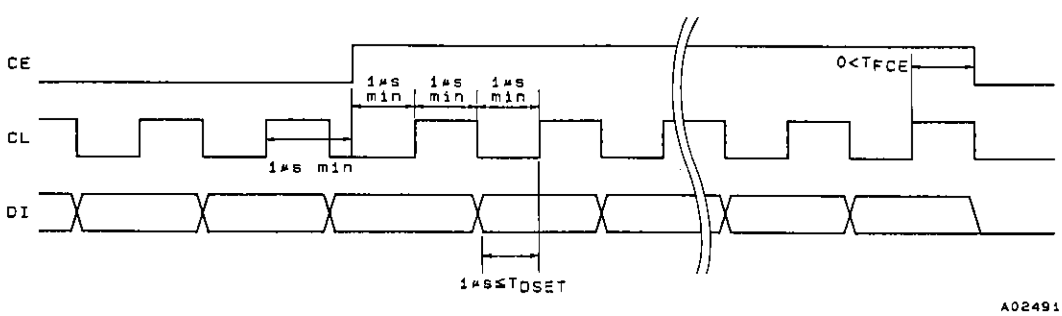
Right channel 1 dB step

Setting state	D4	D5	D6	D7
−∞	0	0	0	0
−4dB	0	1	0	0
−3dB	1	1	0	0
−2dB	0	0	1	0
−1dB	1	0	1	0
0dB	0	1	1	0

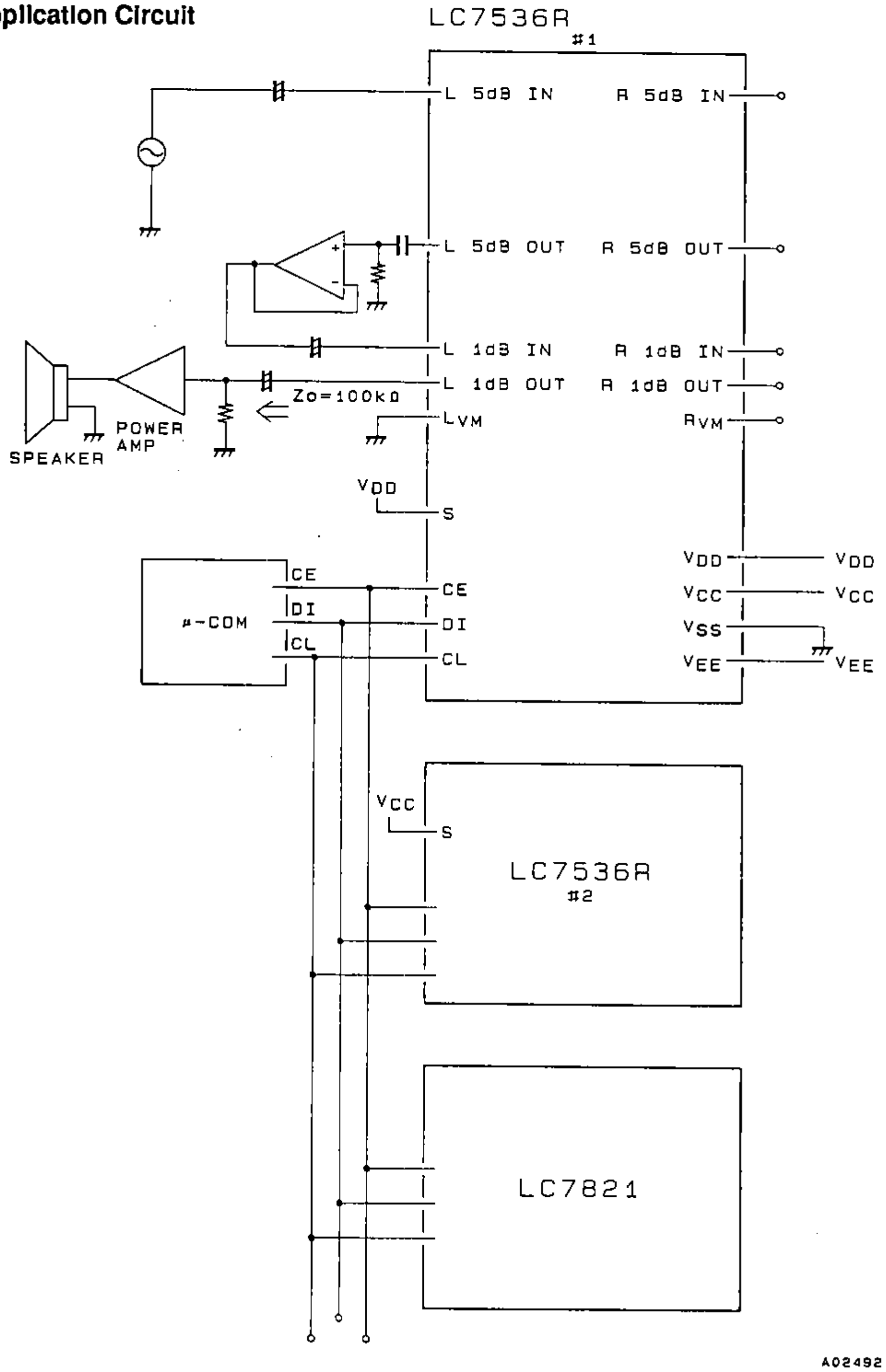
Left channel 1 dB step

Setting state	D12	D13	D14
−∞	0	0	0
−4dB	0	1	0
−3dB	1	1	0
−2dB	0	0	1
−1dB	1	0	1
0dB	0	1	1

A02490



Sample Application Circuit



- No products described or contained herein are intended for use in surgical implants, life-support systems, aerospace equipment, nuclear power control systems, vehicles, disaster/crime-prevention equipment and the like, the failure of which may directly or indirectly cause injury, death or property loss.
- Anyone purchasing any products described or contained herein for an above-mentioned use shall:
  ① Accept full responsibility and indemnify and defend SANYO ELECTRIC CO., LTD., its affiliates, subsidiaries and distributors and all their officers and employees, jointly and severally, against any and all claims and litigation and all damages, cost and expenses associated with such use:
  ② Not impose any responsibility for any fault or negligence which may be cited in any such claim or litigation on SANYO ELECTRIC CO., LTD., its affiliates, subsidiaries and distributors or any of their officers and employees jointly or severally.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.